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Patent Application Papers Of:

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For:

MOISTURE-RESISTANT FLOOR TILE COVERING SYSTEM FOR CONCRETE FLOORS

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BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an improved system for protecting finished flooring over on-grade concrete floors from damage from water vapor penetration and for insulating them from the cool earth temperatures. Concrete floors particularly concrete floors installed or poured over the dirt surfaces of sub-terrainean rooms such as basement living spaces of homes or the ground-level rooms or work spaces of slab-homes or buildings, are particularly susceptible to water vapor penetration. Conventionally, such concrete floors are covered with plastic tiles or carpeting to improve their appearance and make them more comfortable to the feel.

However, concrete floors are relatively porous and also conduct the cold temperature of the ground, which can result in water vapor penetration and condensation at the interior surface of the concrete floor, causing separation of floor tiles adhered thereto or causing a moisture accumulation in carpeting adhered thereto or applied thereover, resulting in mold or mildew. Water vapor and water can penetrate and diffuse through the porous concrete floor from the dampness of the soil or ground beneath the concrete, and also through cracks which can develop in the concrete and/or also can penetrate through interfaces between the floor and the walls and/or footings.

State of the Art:

It is known to build a sub-floor over concrete floors using wooden studs as spacers and covering them with plywood to form an interior floor surface which is then covered by floor tile or carpeting. Such a system is an insulation improvement, but takes up to 2″ of headroom or more. Water vapor can be absorbed by the wooden studs and plywood, resulting in mold, mildew, rot and odors, and separation of tiles from the plywood floor.

An improved flooring system is commercially-available from applicant's company, Basement Systems, Inc., under the trademark ThermalDry® Flooring System. Such system involves interposing an embossed insulating, thermal air-gap, high density plastic barrier sheet between the concrete floor and a plywood or chipboard floor, the barrier sheet being embossed to form rear-surface projections and front surface depressions, to space the concrete floor from the plywood or chipboard floor. The ThermalDry® Flooring System produces excellent results but has the disadvantage that it still incorporates a plywood or chipboard floor, which can absorb water or water vapor which might penetrate from below the plywood or from above the plywood, due to plumbing leaks or flooding. In addition to ground water vapor, water heater leaks and plumbing leaks are common and this water ends up on the basement floor. Therefore, it is imperative to install an insulating flooring system that uses no organic materials. Plywood and chipboard absorb water and water vapor which can cause them to swell and delaminate and can support mold, requiring complete

replacement of the flooring system. Another important disadvantage of this system and of systems such as disclosed in U.S. Patents 5,052,161; 5,489,462 and 5,619,832 is that an embossed plastic barrier sheet does not have a solid, planar or flat upper surface to support a carpet as an outer covering, if desired.

Another flooring system is commercially-available for the insulation of concrete basement floors, comprising 24″ square wood tiles having bonded to the undersurface thereof a backing layer of water-resistant plastic molded with a plurality of spaced water-resistant studs or spacers which provide an air gap between the concrete floor and the wood tiles. Such system is unsatisfactory since the wood tiles, formed from "chipboard", warp and delaminate in the moist atmosphere and/or when wet from above, and support mold and the consequences thereof. Water vapor can penetrate from the porous concrete up through the joints between the wood tiles and the plastic backings and be absorbed, causing swelling of the wood, particularly along the joints. Also a water leak or flood in the basement can saturate the wooden tiles and also can penetrate between the tiles and under the plastic backing, making it impossible to dry or remove the water without ripping up the floor.

SUMMARY OF THE INVENTION

The present invention relates to a water-resistant flooring system for insulating against dampness and cold penetration from concrete sub-floors, and which will not be damaged by water penetration from any direction or

source, including above-floor plumbing problems or flooding.

The present flooring system comprises a thermally-insulating water-vapor-proof, air-gap, solid plastic barrier tile layer system comprising a strong rigid flat solid layer of water-resistant plastic, such as ABS, polyvinyl chloride, polyethylene, polypropylene or polycarbonate, which is either molded with integral spaced plastic legs or spacers such as studs or slots or other raised areas on the underside thereof, or is laminated or bonded to a separate water-resistant solid plastic barrier sheet which is molded with integral spaced plastic legs or spacers such as studs or slots or other raised and/or depressed areas on the underside thereof, to provide spaced leg portions which contact the surface of the concrete floor and which space and support the underside of the flat plastic tile from the surface of the concrete floor to provide an insulating thermal air gap barrier space between about 1/8″ and 1″ high, preferably about 3/8 inch high, to admit and circulate any water vapor penetrating up through the concrete floor beneath the entire barrier tile layer system. The air gap barrier space provides a space network within which the water vapor circulates and comes into equilibrium with the water content of the porous concrete floor. Water condensation, which will occur if you lay a flat sheet of plastic against a concrete floor, is avoided or substantially reduced by the present plurality of spacers which create the air gap barrier space. Water vapor from the concrete floor cannot condense within the air gap, and humid air from the basement living space cannot

penetrate the interlocked plastic tiles to condense on the concrete floor.

The flat plastic barrier tile layer preferably comprises a plurality of square or rectangular solid tiles, such as 6″, 12″, 17″, 24″ square or 48″ or even 4′x8′ rectangular sheets, about 3/8″ to 3/4″ thick, which fit or interlock together such as with tongue-and-groove sides like parquet flooring. As mentioned, the plastic tiles may be formed or molded with the spaced legs or studs on the underside thereof. The top surfaces of the solid plastic tiles are planar and may have a decorative design formed thereon, or the planar upper surface of the plastic barrier tile layer may have a color which is aesthetic, or the tile layer may be after-covered with a conventional ceramic or plastic tile layer or with carpeting or a vinyl surface such as linoleum or vinyl flooring.

DRAWINGS

Fig. 1 is a perspective view of the undersurface of a section of a moisture-resistant floor tile for covering a concrete floor, such as a basement floor;

Fig. 2 is a plan view of the uppersurface of a complete floor tile of the type illustrated by Fig. 1, showing the network of spaced, raised water-resistant studs or legs at the undersurface thereof by means of broken lines;

Fig. 3 is a cross-sectional view of the floor tile of Fig. 2 taken along the line 3-3 thereof;

Figs. 4(a) and 4(b) are isometric and plan views, respectively, illustrating the use of spaced integral studs having rectangular cross-sections;

Figs. 5(a) and 5(b) are views corresponding to Figs. 4(a) and 4(b) but illustrating the use of spaced integral studs having open square cross-sections, and

Figs. 6(a) and 6(b) are views corresponding to Figs. 5(a) and 5(b) but illustrating the use of spaced integral studs having open tubular circular shapes having slots.

DETAILED DESCRIPTION

Referring to Fig. 1, the underside 11 of a corner section of a solid water-resistant plastic floor tile 10 is illustrated, the tile 10 having groove or slot means 12 along two edges thereof and tongue means 13 along the other two edges, as shown in Figs. 2 and 3, for mating with corresponding complementary means on adjacent tiles to lock the tiles to each other and produce a substantially-continuous, smooth plastic floor surface which is water impervious.

The plastic tile 10 of Figs. 1 to 3 is molded to have integral spaced plastic support studs or legs or wall sections 15 projecting a maximum distance from the underside 11 thereof, and intermediate plastic network sections 16 of intermediate height. The legs or wall sections 15 project down a uniform distance to contact the concrete floor 11, a distance of about 5/16", to form an interconnected insulation airspace image network 17

between the upper surface of the concrete floor and the underside of the network sections 16 of the tile 10, which airspace network 17 is continuous and open, and provides a thermal break and reservoir for water vapor which may enter.

As previously disclosed, the present plastic tiles 10 preferably are molded as a unitary plastic tile element, or plastic tiles can be formed with planar upper and lower surfaces and thereafter a plurality of individual plastic studs or spacers and network walls, similar to 15 and 16 in Fig. 1, can be adhered to the planar lower tile surface 11.

An essential requirement is that the studs or legs or wall sections 15 are spaced from each other to provide therebetween an interconnected airspace network such as 16 and 17 shown in Fig. 1 to prevent water vapor passing up through the floor from being isolated in any chambers created by the tile legs or standoffs 15, so that said water vapor does not condense into water under the tile 10. In addition, this interconnected airspace 17 under the plastic floor tile will allow the drying of any water that may temporarily collect under the tiles, such as water from an above-floor plumbing leak, water heater leak, etc. or water from a periodic groundwater leak such as from the floor-wall joint of the foundation. Any collected water vapor is isolated from any organic material by which it can be absorbed, such as wood which when wet nourishes the growth of mold. The isolated water vapor will eventually come into equilibrium with the water vapor content of the concrete floor.

Another embodiment of the invention is an option to vent the space 17 between the concrete floor surface and the underside of the tiles. This can be done passively at the edge of the floor or actively with a fan to blow air under or to drawn air from under the floor and exhaust it into the interior room or outside of the building to dry the spâce under the floor either continuously or only when necessary.

Referring to figs. 4(a) and 4(b), 5(a) and 5(b), and 6(a) and 6(b), these figures illustrate just some of the possible cross-sections for spaced studs or legs 18/19/20 which can be used in association with intermediate network sections 16 and in place of the studs 15 of the water-resistant plastic tile layer 10 of Figs. 1 to 3.

The studs 18 of Figs. 4(a) and 4(b) are rectangular in cross-section and in staggered or offset rows, relative to adjacent rows, as shown.

The studs 19 of Figs. 5(a) and 5(b) are hollow notched squares in cross-section and in staggered rows, as shown, and the studs 20 of Figs. 6(a) and 6(b) are circular in cross-section, similar to studs 15 of Fig. 2, but are hollow and have an opening 21 giving them the appearance of a raised letter "C". The studs 19 and 20 are notched to permit water vapor circulation from within the hollow interiors thereof.

The studs 15, 18, 19 and 20 may have any desired height such as 1/8" up to about 1", most preferably about 3/8"

and are closely spaced and staggered in rows, as shown, for maximum tile support and stability.

Fig. 7 illustrates a plastic tile board 21 which may be in the form of a 17 inch square tile board having opposed tongue and groove edges. The undersurface comprises a gridwork of repeating raised square outlines 22 or studs or stand-offs which contact the concrete basement floor as do the plurality of raised diagonal "X" studs 23, one within each raised square outline 23. This design provides a multiplicity of insulation aerospaces 24 between the underside of the tile board 21 and the surface of the concrete basement floor over which is laid and held in place by the tongue-and-groove engagement.

The preferred tiles 10 for use according to the present invention, as illustrated by Figs. 1 to 3 of the drawings, have a solid planar upper surface 14 and a discontinuous under surface comprising spaced support studs or legs and wall sections 15 which project a maximum uniform distance from the undersurface 11 of the tile 10 to contact the supporting surface, such as a concrete basement floor. The undersurface 11 also comprises spaced intermediate network sections 16 which project a lesser distance from the undersurface 11 of the tile 10 and do not contact the surface of the supporting floor. The space therebetween enables any water vapor which enters from the concrete floor to circulate through the airspace 17 network beneath the tiles and come into equilibrium with the water vapor content of the concrete floor.

The tile design of Figs. 1 to 3 comprises horizontal walls and vertical walls 15 which intersect to form square compartments enclosing diagonal, intermediate height, X-shaped walls 16 and a central post or support leg 15 of maximum height corresponding to the height of the horizontal and vertical walls 15. In order to provide a circulation airspace 17 beneath the tiles 10 of Figs 1 to 3 it is necessary to provide openings or ports in the vertical and/or horizontal walls to reduce sections thereof from a maximum height 15 to an intermediate height 16 and to enable any water vapor to circulate or be moved through an air circulation network 17 beneath all areas of each tile 10.

Air circulation spaces are provided between adjacent tiles 10 between the groove or slot means 12 along two adjacent edges of each tile, and under the elongate tongue means 13 along the other two adjacent edges of each tile. Referring to Fig. 2 of the drawing, each groove or slot means 12 has a maximum height corresponding to the height of the spacers 15 so as to provide therebetween an air port. Also the elongate tongue means 13 along the other edges of the tile 10 comprises a plurality of spaced stop support members 25 which limit the extent of entry of the tongue means 13 into the slot means 12, provide space between the members 25 to enable the circulation of water vapor beneath the tiles, and make contact with the basement floor to further support the tile thereon.

The studs 15, 18, 19, 20, 23 and 24 may have any desired height such as 1/8″ up to about 1″, most preferably about

3/8" and are closely spaced and staggered in rows, as shown, for maximum tile support and stability.

It should be understood that the foregoing description is only illustrative of the invention. Various alternatives and modifications can be devised by those skilled in the art without departing from the invention. Accordingly, the present invention is intended to embrace all such alternatives, modifications and variances which fall within the scope of the appended claims.